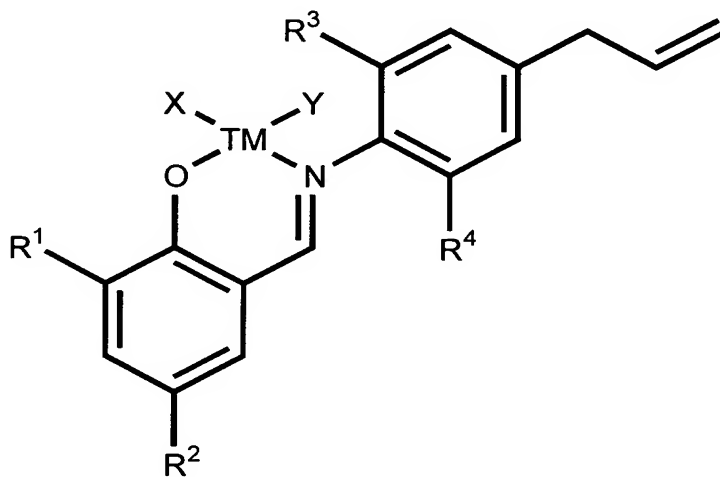


Claims

What is Claimed is:

1. A composition comprising the product of combining, in the presence of a free radical initiator, a catalyst precursor and at least one catalyst polymerization monomer wherein the catalyst polymerization monomer is polymerizable by free-radical polymerization and wherein the catalyst precursor has the formula:



wherein

- (a) R¹ and R² are independently hydrogen, NO₂, or hydrocarbyl groups;
- (b) R³ and R⁴ are independently hydrogen or hydrocarbyl groups;
- (c) TM is a Group-4-11 metal;
- (d) X is an abstractable ligand; and
- (e) Y is a neutral Lewis base.

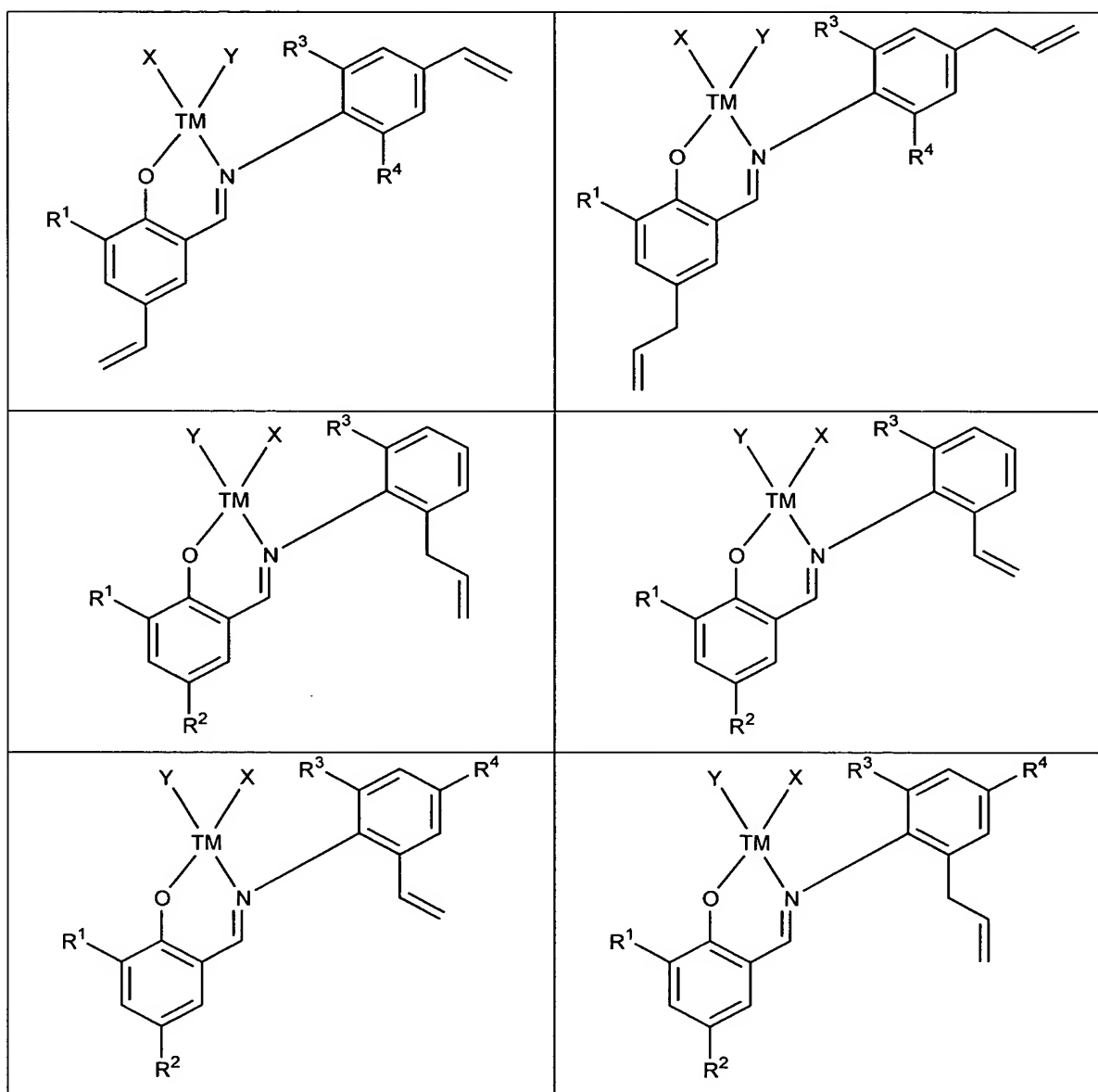
2. The composition of Claim 1 wherein a hydrocarbyl group is a C₁-C₅₀ hydrocarbyl group.
3. The composition of Claim 2 wherein a hydrocarbyl group is a C₁-C₄₀ hydrocarbyl group.
4. The composition of Claim 3 wherein a hydrocarbyl group is a C₁-C₂₀ hydrocarbyl group.
5. The composition of Claim 1 wherein TM is a Group-10 transition metal.
6. The composition of Claim 1 wherein TM is selected from Ni.
7. The composition of Claim 1 wherein the abstractable ligands are independently halide radicals, hydride radicals, hydrocarbyl radicals, or hydrocarbyl-substituted, organometalloid radicals.
8. The composition of Claim 7 wherein abstractable ligands are independently halide, alkoxide, aryloxy, amide, or phosphide radicals.
9. The composition of Claim 8 wherein abstractable ligands are chloride, bromide, iodide, methyl, ethyl, propyl, butyl, pentyl, hexyl, phenyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, hydride, phenyl, benzyl, phenethyl, tolyl, methoxy, ethoxy, propoxy, butoxy, dimethylamino, diethylamino, methylethylamino, phenoxy, benzoxy, allyl, 1,1-dimethyl allyl, 2-carboxymethyl allyl, acetylacetonate, 1,1,1,5,5,5-hexa-fluoroacetylacetonate, 1,1,1-trifluoro-acetylacetonate, or 1,1,1-trifluoro-5,5-di-methylacetylacetonate radicals.

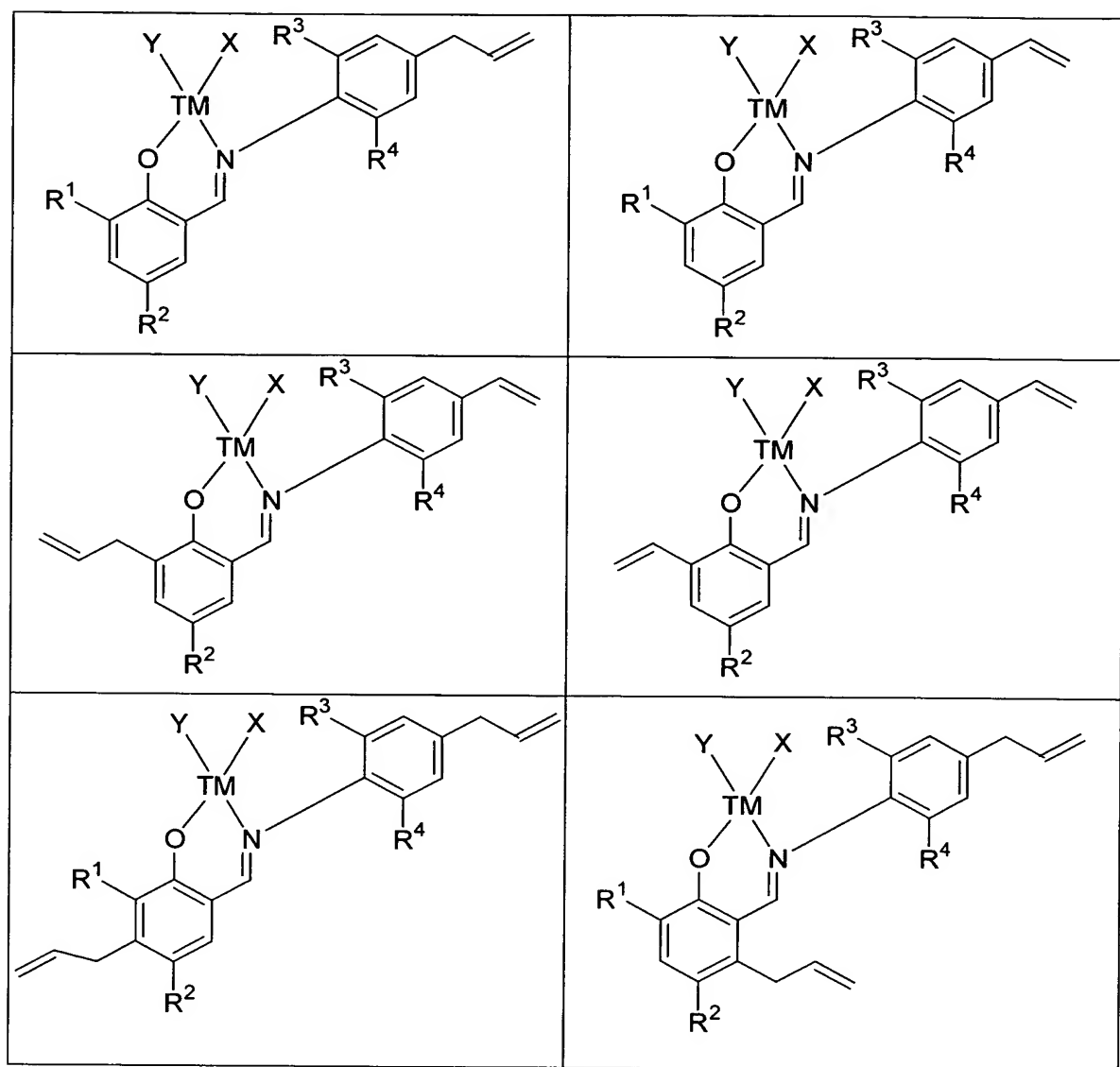
10. The composition of Claim 9 wherein at least one abstractable ligand is chloride.
11. The composition of Claim 1 wherein the catalyst polymerization monomer is selected from styrene, vinyl styrene, alkyl styrene, isobutylene, isoprene, or butadiene.
12. The composition of Claim 11 wherein the catalyst polymerization monomer is styrene.
13. The composition of Claim 1 wherein the free radical initiator is selected from azo initiators or peroxides.
14. The composition of Claim 13 wherein the free radical initiator is selected from dialkyldiazenes, hyponitrites, diacyl peroxides, dialkyl peroxydicarbonates, peresters, alkyl hydroperoxides, dialkyl peroxides, or inorganic peroxides.
15. The composition of Claim 14 wherein the free radical initiator is selected from 2,2'-azobis(2-methylpropanenitrile), 1,1'-azobis(1-cyclohexanenitrile), 4,4'-azobis(4-cyanovaleric acid), triphenylmethylazobenzene, di-t-butyl hyponitrite, dicumyl hyponitrite, dibenzoyl peroxide, didodecanoyl peroxide, diacetyl peroxide, diisopropyl ester, dicyclohexyl ester, cumyl hydroperoxide, t-butyl hydroperoxide, dicumyl peroxide, di-t-butyl peroxide, hydrogen peroxide, and persulfate initiators.
16. The composition of Claim 1 wherein Y is selected from amines, phosphines, or nitriles.

17. The composition of Claim 16 wherein Y is selected from triphenyl phosphine or acetonitrile.

18. An olefin polymerization method comprising contacting the compositions of Claim 1 with an olefin.

19. The composition of Claim 1 wherein the catalyst precursor has the formula:





wherein

- (a) R^1 and R^2 are independently hydrogen, NO_2 , or hydrocarbyl groups;
- (b) R^3 and R^4 are independently hydrogen or hydrocarbyl groups;
- (c) TM is a Group-4-11 metal;
- (d) X is an abstractable ligand;